REMARKS

The present application includes claims 1-32. Claims 1-11, 19, 20, 22-27, and 29-32 were rejected by the Examiner. Claims 12-18, 21, and 28 were objected to by the Examiner. By this amendment, claims 1, 12, 17, 19, 21, 23 and 28 have been amended.

The abstract was objected to because it contained more than 150 words. A corrected abstract is submitted with this response. No new matter is added in the corrected abstract.

Claims 1-5, 7-11, 19-20, 22-27, and 29-32 were rejected under 35 U.S.C. §102(e) as being anticipated by Takahashi et al., U.S. Patent No. 6,240,075.

Claim 6 was rejected under 35 U.S.C. §103(a) as being unpatentable over Takahashi, in view of Wright et al., U.S. Patent No. 6,366,776.

Claims 12-18, 21, and 28 were objected to as being dependent upon a rejected base claim, but the Examiner indicated that these claims would be allowable if rewritten in independent claim form including all of the limitations of the base claim and any intervening claims. Claims 12, 17, 21, and 28 have been rewritten independent claim form as instructed by the Examiner.

The rejection of claims 1-5, 7-11, 19-20, 22-27, and 29-32 under 35 U.S.C. §102(e) as being anticipated by Takahashi is respectfully traversed. Takahashi teaches satellite communication routing techniques. That is, Takahashi presents a satellite communication system that switches data cells between input and output nodes according to an arbitration scheme (column 1, lines 30-62). Takahashi includes an orbiting communication satellite that receives radio frequency uplink beams from a group of ground-based communication stations (column 2, lines 16-28). The uplink beams are demodulated into asynchronous transfer mode (ATM) cells, which do not contain assigned virtual path identifiers, or VPIs (column 2, lines 16-28, lines 58-65). The ATM data cells are then processed by processing modules (column 2, lines

28-33). A processor (item 54 in Figure 1) in a processing module (item 50 in Figure 1) determines if the ATM data cell, which does not contain an assigned VPI, requires multicast processing (35-46). The processor then adds a routing code to each ATM data cell from a look up table memory (item 56 in Figure 1) that corresponds to a multicast or outbound processing module on the satellite (column 2, lines 47-58). Thus, the system of Takahashi includes a lookup table of routing codes and a processor to assign output routing codes to input data cells, which do not contain VPIs (column 2, lines 47-65). Only after the ATM data cells have been routed to an output module via the lookup table without the use of VPIs may VPIs and virtual channel path identifiers (VCIs) be added by the processor to the ATM data cells (column 2, lines 58-65).

In Takahashi, the ATM data cells are stored in memory queues waiting their turn for transmission (column 3, lines 9-11). An output arbitrator and code reader (item 82 in Figure 1) reads the output routing code assigned to the data cell and uses the routing code, decision factors, and other criteria regarding the data cell to determine priority and determine to which output port the data cell should be switched (column 3, lines 21-44, column 4, lines 34-67). The code reader/arbitration module reads the routing tag that was assigned to the ATM data cell by the processor after receipt at the satellite uplink and before the addition of a VPI and performs arbitration of multiple ATM data cells waiting for the same output port (column 3, lines 31-33, column 4, lines 36-61). The arbitration module uses routing codes and decision factors, such as priority codes, to determine a data transmission order (column 4, lines 34-55). If all decision factors are equal, the arbitration module appends a pseudo random sequence number to the priority factor and other decision factors to determine a priority of transmission for the ATM data cells based on the unique sequence assigned to each ATM data cell (column 4, lines 60-67, column 5, lines 21-42). The pseudo random sequence changes for each output port arbitration

and ensures that one port is not favored over another port and result in poor performance (column 5, lines 51-55).

Conversely, the invention of Applicant teaches virtual path switching of a data cell on a satellite based on an assigned VPI. Unlike Takahashi, in which a VPI may be assigned to an ATM data cell only after the routing of the ATM data cell to the output has been determined for use after satellite downlink transmission, the invention of Applicant teaches an uplink with data cells containing assigned VPIs used to determine data cell routing in the satellite for output transmission from the satellite. The transmission path of a data cell at the satellite is determined based on the data cell's assigned VPI. As recited in claim 1, a data cell is received at a satellite input port. Then, the VPI of the received data cell is examined to determine the output port with which the data cell is associated. Finally, the data cell is transferred to the output port of the satellite based on the VPI. In claim 19, the data cell is received at a satellite input port. The VPI of the data cell is examined to determine the destination output port of the data cell based on the VPI, and a routing tag is attached to the data cell identifying a next virtual channel link. Then, the data cell is transferred to the destination output port based on the VPI. In claim 23, circuitry in the satellite path switching apparatus responds to address bits in a data cell and to an assignment of the address bits to the output ports based on an assigned virtual path identifier (VPI) in the data cell to couple the data cell to at least one output port.

Takahashi does not teach examining an assigned VPI in a data cell to determine a destination output port associated with the assigned VPI, as recited in claims 1 and 19. On the contrary, Takahashi determines data cell routing from a look up table prior to the assignment of a VPI to the data cell. Additionally, Takahashi does not teach attaching a selected routing tag identifying a next virtual channel link to the data cell based on the assigned VPI, as recited in

claim 19. Furthermore, Takahashi does not teach transferring the data cell to the destination output port based on the assigned VPI, as recited in claims 1 and 19. Rather, transmission of the ATM data cells in Takahashi is based on a routing code from a look up table along with a priority code or similar decision factor. In addition, Takahashi does not teach circuitry responsive to address bits in a data cell and to an assignment of the address bits to an output port based on the assigned VPI for coupling the data cell to at least one of the output ports, as recited in claim 23. Rather, as described above, Takahashi assigns an output port to an ATM data cell without a VPI based on a look up table prior to the assignment of a VPI to that data cell for use in later transmission outside the satellite.

Thus, as described above, Takahashi assigns a VPI to a data cell after cell routing to a satellite output port has been determined. As a result, Takahashi does not teach examining an assigned VPI of a data cell to determine a destination output port based the VPI of the data cell, as recited in claims 1, 19, and 23. In fact, Takahashi teaches away from examining an assigned VPI of a data cell to determine a destination output port from the VPI of the data cell. Therefore, Applicant respectfully submits that independent claims 1, 19, and 23 and all of their dependent claims are allowable.

Since claim 6 depends from claim 1, Applicant respectfully submits that claim 6 is allowable, as discussed above. However, Applicant will proceed to discuss the Examiner's rejection of claim 6 under 35 U.S.C. §103(a) as being unpatentable over Takahashi, in view of Wright. Wright teaches end-to-end transmission techniques for a processing satellite system. Wright does not discuss routing of data cells between input and output ports in the satellite. Wright also does not discuss the use of VPIs in data cells for routing.

In Wright, data cells are transmitted to a communications satellite via an uplink (column 1, lines 40-42, Fig. 1). The data cells are grouped and encoded with an error correction code prior to transmission via an uplink (column 1, lines 46-48). The encoded data cells are modulated into uplink channels for transmission to a satellite (column 1, lines 50-56). Once the modulated, encoded uplink channels arrive at the satellite, the channels are demodulated and the error correction codes decoded without regard to a particular routing scheme or use of VPIs (column 1, lines 58-61). Errors in the error correction codes from the uplinked data cells are detected and the satellite decoder makes an error estimate (column 1, lines 60-63). Then, report cells are generated containing the error estimate information and transmitted on a downlink beam, without regard to a VPI or particular routing scheme, to a ground terminal (column 1, lines 64-67, column 2, lines 1-8). The power level of the satellite uplink is adjusted by a processor at the ground terminal in response to the error report cells to ensure transmissions reliably reach the satellite and are not distorted (column 2, lines 4-8). Thus, Wright does not teach a scheme for routing of data cells between input and output ports in the satellite. Particularly, Wright does not teach the use of VPIs in data cells for routing to satellite outputs.

Therefore, Wright does not teach examining an assigned VPI of a data cell received at a satellite to determine a destination output port from the VPI of the data cell, as recited in claims 1, 19 and 23. Additionally, Wright does not teach examining a control subfield to determine a level of error control for the data cell routed to an output port based on an assigned VPI, as recited in claim 6. In addition, Wright does not teach transferring the data cell to a destination output port of the satellite based on the assigned VPI, as recited in claim 6.

As discussed above, Takahashi does not teach examining an assigned VPI of a data cell to determine a destination output port from the VPI of the data cell. Takahashi also does not

teach examining a control subfield to determine a level of error control for the data cell. Thus, neither Takahashi nor Wright, alone or in combination, teach or suggest the limitations of claim 6. That is, neither Takahashi nor Wright not teach or suggest determining output port information from a received data cell VPI and further examining a control subfield of the data cell to determine a level of error control for the data cell, as recited in claim 6. In fact, Takahashi teaches the opposite and requires a table lookup to determine the appropriate output port prior to assigning a VPI and making an arbitration decision regarding transmission priority without considering an assigned VPI. Therefore, Applicant respectfully submits that claim 6 is allowable.

Claims 1, 19, and 23 have been amended to include the limitation that the data cell is transferred or assigned to the destination output port based on the assigned VPI. As discussed above, Takahashi does not teach this limitation. Consequently, Applicant respectfully submits that claims 1, 19, and 23 as amended are not anticipated by Takahashi. Thus, claims 1, 19, 23, and their dependent claims should be allowable. Additionally, dependent claims 12, 17, 21, and 28 have been rewritten in independent claim form as instructed by the Examiner. Therefore, claims 12, 17, 21, 28, and their dependents should be allowable.

Application No. 09/408,808 Docket No. 22-0074

Accordingly, the application as amended is believed to be in condition for allowance and an action to this effect is respectfully requested.

Respectfully submitted,

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Application No. 09/408,808 Docket No. 22-0074

ATTACHMENT FOR CLAIM AMENDMENTS
VERSION WITH MARKINGS TO SHOW CHANGES MADE
Serial No. 09/408,808; Filed: September 29, 1999

1. (Amended) In a processing satellite communications system including at least one processing satellite having a receiver and a transmitter for respectively receiving and transmitting a data cell, a method for virtual path switching of said data cell, the method comprising:

receiving a data cell at one of a plurality of input ports of [said] a processing satellite;

examining an assigned virtual path identifier (VPI) in said data cell to determine a destination output port associated with said assigned VPI; and

transferring said data cell to said destination output port based on said assigned VPI.

12. (Amended) In a processing satellite communications system including at least one processing satellite having a receiver and a transmitter for respectively receiving and transmitting a data cell, a method for virtual path switching of said data cell, the method comprising:

receiving a data cell at one of a plurality of input ports of said processing satellite;

examining an assigned virtual path identifier (VPI) in said data cell to determine a destination output port associated with said assigned VPI;

transferring said data cell to said destination output port;

providing at least one multicast module on said processing satellite wherein said multicast module is associated with one multicast output port;

providing at least one multicast routing table having memory locations storing addressing information;

establishing a set of VPIs wherein each VPI is uniquely associated with a single output port on said processing satellite, and wherein at least one of said VPIs is a multicast VPI uniquely associated with said multicast output port;

establishing a set of VCIs;

assigning said multicast VPI to said data cell, wherein said transferring step comprises transferring said data cell to said multicast output port uniquely associated with said assigned multicast VPI;

assigning a VCI from said set of VCIs to said data cell;

[The method for virtual path switching of claim 11 further comprising:]

receiving said data cell by said multicast module associated with said multicast output port;

examining said assigned VCI to determine a multicast group of VPIs from said set of VPIs;

reproducing said data cell to create a predetermined number of reproduced data cells; and

reassigning each of said reproduced data cells with a new VPI from said multicast group of VPIs.

17. (Amended) [The method for virtual path switching of claim 3] In a processing satellite communications system including at least one processing satellite having a receiver and a transmitter for respectively receiving and transmitting a data cell, a method for virtual path switching of said data cell, the method comprising:

receiving a data cell at one of a plurality of input ports of [said] a processing satellite;

examining an assigned virtual path identifier (VPI) in said data cell to determine a destination output port associated with said assigned VPI;

transferring said data cell to said destination output port;

establishing a set of VPIs wherein each VPI is uniquely associated with a single output port on said processing satellite;

establishing a set of virtual channel identifiers (VCIs);

assigning said assigned VPI from said set of VPIs and a VCI from said set of VCIs to said data cell; and

transmitting said data cell to said processing satellite;

wherein said step of assigning comprising assigning an externally managed VPI and an externally managed VCI, and wherein said step of examining comprises examining said assigned externally managed VPI in said data cell to determine a destination output port associated with said assigned externally managed VPI.

19. (Amended) In a processing satellite communications system including at least one processing satellite having a receiver and a transmitter for respectively receiving and transmitting a data cell, a method for expanded address virtual path switching of said data cell, the method comprising:

receiving a data cell at one of a plurality of input ports of a processing satellite;

examining an assigned virtual path identifier (VPI) in said data cell to determine a destination output port associated with said assigned VPI;

attaching a selected routing tag to said data cell based on said assigned VPI, said routing tag identifying a next virtual channel link; and

transferring said data cell to said destination output port based on said assigned VPI.

21. (Amended) In a processing satellite communications system including at least one processing satellite having a receiver and a transmitter for respectively receiving and transmitting a data cell, a method for expanded address virtual path switching of said data cell, the method comprising:

receiving a data cell at one of a plurality of input ports of a processing satellite;

examining an assigned virtual path identifier (VPI) in said data cell to determine a destination output port;

attaching a selected routing tag to said data cell, said routing tag identifying a next virtual channel link;

transferring said data cell to said destination output port;

assigning said assigned VPI to said data cell;

assigning a virtual channel identifier (VCI) to said data cell;

[The method for virtual path switching of claim 20 further comprising:]

establishing at least two VPIs corresponding to a single output port; and

establishing a set of VCIs.

23. (Amended) An apparatus for path switching a data cell to a satellite output port for transmission in a downlink, the apparatus comprising:

an input module comprising a plurality of input ports;

an output module comprising a plurality of output ports; and

circuitry responsive to address bits in a data cell and to an assignment of said address bits to said output ports based on an assigned virtual path identifier (VPI) in said data cell, for coupling said data cell to at least one of said output ports.

28. (Amended) [The apparatus for path switching of claim 26 wherein] An apparatus for path switching a data cell to a satellite output port for transmission in a downlink, the apparatus comprising:

an input module comprising a plurality of input ports;

an output module comprising a plurality of output ports; and

circuitry responsive to address bits in a data cell and to an assignment of said address bits to said output ports, for coupling said data cell to at least one of said output ports, said address bits include at least a portion of a virtual path identifier (VPI), said assignment includes an assignment of an output port associated with at least two VPIs.

Application No. 09/408,808 Docket No. 22-0074

ATTACHMENT FOR ABSTRACT AMENDMENT
VERSION WITH MARKINGS TO SHOW CHANGES MADE
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The present invention provides a method (100) for virtual path switching of an ATM cell on a processing communications satellite. The method includes establishing a set of VPIs (104)[, where each VPI is] associated with [an] output ports on the satellite[. The method also includes establishing a set of VCIs (106),] and assigning one VPI [and one VCI] to an ATM cell (108). The ATM cell may then be [transmitted to, and then] received by an input port of the satellite (110). An associated output port (114) for the ATM cell is determined from the VPI, and the ATM cell is transferred to that output port (116). [The method also includes determining an associated output port (114), and transferring the ATM cell to that output port (116). The VPI may be divided into a control subfield and a routing subfield, and the associated output port may be determined based on the routing subfield (808).] The present invention may also provide for multicast switching (400). [For example, the method may include providing at least one multicast routing table (404).] The VPI assigned to the ATM cell may be associated with a multicast output port. [Thus, the ATM cell may be transferred to that multicast output port (418) and then received at the associated multicast module (420). A multicast group of VPIs may then be determined (422, 424), and the ATM cell may be reproduced several times (426).] The [reproduced] ATM cells may be reproduced (426) and reassigned with a new VPI from [the] a multicast group of VPIs (428)[, and the reproduced cells are once again presented to and received by an input port of the satellite (430)]. The reproduced cells are received at an input port of the satellite (430) for routing to the corresponding output ports.